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A Study on Ensemble Forecasting of Soil Moisture Based on TIGGE

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Land surface processes are closely related to atmosphere such as precipitation, solar radiation and relative humidity. In light of the aim of TIGGE(THORPEX Interactive Grand Global Ensemble) is to accelerate the improvements in the accuracy of 1-day to 2 week high-impact weather forecasts, a forecast scheme of soil moisture based on multi-model ensembles forced by TIGGE was developed to predict more realistic soil moisture on daily time scale. Soil moisture simulations by the multiple land surface models including BATS, CLM3.0 and CLM3.5 drived by TIGGE deterministic weather forecast were assembled by BMA method to forecast soil moisture in Inner Mongolia. Soil moisture observations only are available 3 times per month, and those are 8th, 18th and 28th in every month. All of the land surface models were operating on 0.5o×0.5o grid cell. The leading time of predictions ranges from 1-day to 8-day. EM (Expectation-Maximization) algorithm was adopted to estimate the weightings and variances of the BMA. Because of the mismatching of grid forecasts with site observations, comparisons on regional scale were recommended. According to planting division and soil moisture climatology, calibrations and validations of soil moisture ensemble forecast scheme were performed in 6 regions selected in Inner Mongolia. All of the regions cover about 4 or 30 grid cells. Experiments were conducted from March to October in 2007 and the capability of the prediction by the ensemble modeling was characterized by RMSE (root mean square error) and correlation between the observation and the forecasts of different leading time. The results indicate that BMA method which outperforms the simple average mean method could greatly reduce the bias in the soil moisture forecasts from multi-models; in most regions in Inner Mongolia, soil moisture predictions with 3-day's leading time is more reliable, and the ensemble scheme performs well especially in region 504 and 2301 with the correlation up to 0.8.

KEYWORDS: land surface, multi-model ensembles, hydrological cycle, soil moisture, ensemble forecast, TIGGE